ILLINOIS STATE GEOLOGICAL SURVEY
Urbana, Illinois
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ILLINOIS INDUSTRIAL MINERALS NOTES

Number 3, March 15, 1956

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This issue of Industrial Minerals Notes consists of two capsule reports, one dealing with the industrial mineral industry of Illinois in 1955 and the other with trace elements and potash in some Illinois gravels.

The Industrial Minerals Industry in Illinois in 1955

W. H. Voskuil and W. L. Busch

Estimates of value of mineral production for Illinois indicate that 1955 was one of the most productive years on record. Production values of industrial minerals in general rose approximately 6 percent over values for 1954.

Production of stone, cement, lime, and structural sand and gravel is estimated to have increased between two and three million dollars in value during the year.

Clay products valued at 49 million dollars accounted for another 2 million dollars of the increased value of raw minerals. Clay products include such items as face and common brick, sewer pipe, flue pipe, drain and building tile, vitreous plumbing fixtures, glazed tile, and electrical porcelains. The metallurgical industries continued a brisk demand for various forms of special heat-resistant fire brick and silica brick.

Special sands, such as silica sand and natural bonded molding sand, also were in increased demand. Silica sand, which is the backbone of an extensive glass industry, is now used also by the oil industry in hydraulic fracture treatment of oil-bearing rock. Both silica sand and natural bonded molding sand go into molds for making metal castings, such as cylinder heads for automobile engines.

Fluorspar and metals, which had fallen off in value to less than 10 million dollars in 1954, are again in demand and their value climbed to 11 1/2 million dollars in 1955. Fluorspar still encounters competition from foreign mines, but the increased demand from the manufacturers of hydrofluoric acid and from the steel industry has brought a number of Illinois mines back into production.

The estimates of value are based on raw minerals, or first marketable products. They represent values at the mines, pits, and quarries and do not

take into account the value added by further refining, processing, manufacturing, or transporting.

Estimated Value of 1955 Industrial Minerals

Stone and stone products: limestone, dolomite, cement, lime	$ 53,800,000
Clay and clay products	49,000,000
Sand and gravel: structural or common sand and gravel; special sands	23,700,000
Fluorspar and metals (zinc, lead, and silver)	11,500,000
Total	$138,000,000

Trace Elements and Potash in Some Illinois Gravels

J. E. Lamar and R. S. Shrode

In recent years attention has been called to the fact that certain kinds of slags and rocks that generally are considered relatively insoluble do none the less serve to reduce soil acidity or to contribute elements to the soil that benefit plant growth. Greensand has long been used in some places as a source of potassium and lately it is reported that pulverized granite has been proposed as a source of the same element, the potassium presumably deriving from potash feldspar in the granite.

Most Illinois gravels are composed predominately of limestone and dolomite pebbles, but some contain a considerable percentage of igneous rock pebbles, including granite. A brief investigation was made, therefore, to determine the potash and trace element content of selected samples, not primarily with the thought that the gravels, if pulverized, would in themselves serve as commercial fertilizers, but to obtain data from which specialists in the field of fertilizer materials could determine whether some gravels may have merit as a combined fertilizer and agricultural limestone. If this were possible it might afford an outlet for some gravels or for certain sizes of gravel that are unavoidably produced during the operation of some gravel deposits in quantities in excess of demand.

Seven gravel deposits believed to be among those most likely to have a high igneous rock content were sampled. Results of pebble counts are given in table 1. The three samples that contained the largest percentage of igneous rock were chosen for further study. Two of the samples, SL89 and SL132, came from central Illinois, and sample SL122 from northwestern Illinois. Each sample was sieved to four different sizes for analysis in order to determine how potash and trace element content varied with gravel size.

Analyses were made spectrographically with the high voltage A.C. arc and results are given in tables 2 and 3, together with figures for the limits of detection. These figures indicate the smallest amount of an element that could be detected by the analytical procedures used. As the gravel was

crushed in a laboratory jaw crusher with stellite-faced plates, some, probably slight, addition of chromium, cobalt, and tungsten may have resulted from the plates. Among the elements sought, none of the following were present in sufficiently large amounts to be recognized within the limits of detection employed: antimony, beryllium, bismuth, cadmium, gallium, germanium, gold, indium, mercury, molybdenum, columbium, phosphorus, platinum, silver, thallium, tin, vanadium, tungsten, zinc, and zirconium. The limits of detection of molybdenum, phosphorous, and zinc, which may be agriculturally significant, were respectively .01, 1.0, and .02 percent.

Results of calcium carbonate equivalent tests to indicate the quantity of limestone and dolomite in the 3 samples are given in table 4.

It is concluded from the data given that some Illinois gravels contain appreciable amounts of potash and of the agriculturally significant trace elements boron, copper, manganese, and possible others. It seems likely that those gravels that contain the largest percentage of light-colored igneous rock pebbles, such as granite and syenite, will be higher in potash and, conversely, that the high limestone and dolomite gravels will be relatively low in potash. Whether a pulverized gravel may have significance as a combined liming and fertilizing material in any given area depends upon a great many factors which are not of a geological nature and, therefore, beyond the scope of this study. The needs of different soils, the rate of availability of the potash and trace elements in the gravel, and the economics of pulverizing gravel for agricultural use all are factors to be considered.

[illegible] with stellite-faced points, some [illegible] nickel, and tungsten [illegible] none of the following were [illegible] within the limits of detection [illegible] cadmium [illegible] gallium [illegible] silver, [illegible]

[illegible] test to indicate [illegible] are given in table [illegible]

[illegible] that some (Illinois) gravel [illegible] agriculturally [illegible] probable others. It [illegible] likely that [illegible] largest percents of light-[illegible] rock [illegible] syenite, will be higher in potash and [illegible] intermediate gravels will [illegible] relatively low [illegible] may have significance [illegible] combined liming and [illegible] many sectors which [illegible] therefore, beyond the scope of this study. [illegible] the value of availability [illegible] occurrence of pulverized [illegible] gravel [illegible] [illegible] continued [illegible]

Table 1. - Pebble Counts of 1/2 by 1 Inch Fraction of Samples

Sample	Light-colored igneous pebbles*	Dark-colored igneous pebbles†	Limestone and dolomite	Miscellaneous pebbles**
	Percent by number of pebbles			
Northern Illinois				
SL103	9	5	76	10
SL105	0	0	92	8
SL111	6	2	72	20
SL116	8	4	72	16
Central Illinois				
SL89	14	5	40	41
SL132	14	7	43	36
Northwestern Illinois				
SL122	42	12	8	38

* Granites and similar rocks.
† Traprock, basalt, peridotite, and similar rocks.
** Siltstone, quartz, chert, and unidentified rocks.

Table 2. - Potash and Trace Element Content in Percent by Weight*

Sample and Size (inches)	Potash**	Potassium	Boron	Cobalt	Copper	Manganese	Barium	Chromium	Lead	Titanium
	Elements									
SL89										
- 1/8	1.42	1.18	.006	.002	.014	.032	.04	.002	.024	.20
1/8 x 1/4	1.17	.97	.006	.002	.006	.046	.04	.002	.014	.20
1/4 x 1/2	1.23	1.02	.008	.002(?)	.001	.044	.04	.004	.013	.20
1/2 x 1	1.17	.97	.006	.002	.008	.036	.04	.004	.007	.20
SL132										
- 1/8	1.54	1.28	.010	.002	.060	.026	.04	.002	.036	.22
1/8 x 1/4	1.73	1.44	.006	.002	.016	.076	.04	.004	.002(?)	.20
1/4 x 1/2	1.28	1.06	.006	.002	.006	.092	.04	.006	.003	.20
1/2 x 1	1.54	1.28	.006	.002	.008	.094	.02	.010	.005	.20
SL122										
- 1/8	1.87	1.55	.006	.002	.001	.014	.04	.002	.010	.26
1/8 x 1/4	3.02	2.51	.006	.005(?)	.006	.067	.10	.008	.012	.27
1/4 x 1/2	3.16	2.62	n.d†	.002	.011	.068	.08	.010	.016	.84
1/2 x 1	3.79	3.15	n.d	.005(?)	.005	.043	.06	.010	.010	.21
Limit of detection		0.1	.006	.002	.002	.003	.02	.002	.002	.2

* Analyses by Juanita Witters, Geochemistry Section, Illinois State Geological Survey.
** Calculated from potassium.
† Not detected.

Table 3. - Potash and Trace Element Content in Pounds per Ton

Sample and Size (inches)	Elements									
	Potash*	Potassium	Boron	Cobalt	Copper	Manganese	Barium	Chromium	Lead	Titanium
SL89										
- 1/8	28.4	23.6	.12	.04	.28	.6	.8	.04	.48	4
1/8 x 1/4	23.4	19.4	.12	.04	.12	.9	.8	.04	.28	4
1/4 x 1/2	24.6	20.4	.16	.04(?)	.02	.9	.8	.08	.26	4
1/2 x 1	23.4	19.4	.12	.04	.16	.7	.8	.08	.14	4
SL132										
- 1/8	30.8	25.6	.20	.04	1.2	.5	.8	.04	.72	4
1/8 x 1/4	34.6	28.8	.12	.04	.32	1.5	.8	.08	.04	4
1/4 x 1/2	25.6	21.2	.12	.04	.12	1.8	.8	.12	.06	4
1/2 x 1	30.8	25.6	.12	.04	.16	1.9	.4	.20	.1	4
SL122										
- 1/8	37.4	31.0	.12	.04	.02	.3	.8	.04	.20	5
1/8 x 1/4	60.4	50.2	.12	.10(?)	.12	1.3	2.0	.16	.24	5
1/4 x 1/2	63.2	52.4	n.d.†	.04	.22	1.4	1.6	.20	.32	17
1/2 x 1	75.8	63.0	n.d.	.10(?)	.1	.9	1.2	.20	.20	4
Limit of detection		2.	.12	.04	.004	.6	.4	.04	.04	4

* Calculated from potassium.
† Not detected.

Table 4. - Neutralizing Value of Gravel

Sample	Calcium carbonate equivalent (percent)
1/4 x 1/2 inch gravel	
SL89	42
SL132	51
SL122	5
1/2 x 1 inch gravel	
SL89	40*
SL132	43*
SL122	8*

* Estimated; based on pebble counts.